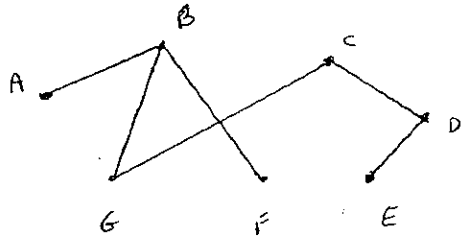
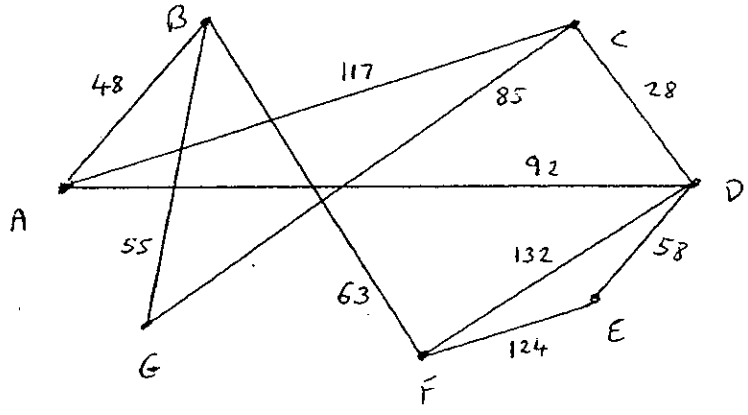
edexcel

January 2006
6689 Decision D1
Mark Scheme

Question Number	Scheme	Marks
1) (a)	There are 2 unmatched vertices on each side – the algorithm only matches one on each side per iteration.	B1 (1)
(b)	e.g. $E-3=C-1$ c.s. $E=3-C=1$	m1 A1 (2)
	$F-5=A-6=D-2=B-4$ c.s. $F=5-A=6-D=2=B-4$	m1 A1 (2)
	$A=6 \quad B=4 \quad C=1 \quad D=2 \quad E=3 \quad F=5$	m1 A1 (2)
		[7]
2) (a)	AB, BG, BF ; GC, CD, DE {1 2 5 6 7 4 3}	m1 A1 A1 (3)
	Weight 337m	B1
		B1✓ (2)
(b)		m1 A1 A1 (3)
(c)	$AB + CF = 48 + 160 = 208$	m1 A1
	$AC + BF = 117 + 63 = 180$ *	A1
	$AF + BC = 111 + 140 = 251$	A1 (4)
	e.g. $A\,\overline{BF}\,B\,G\,\underline{C}\,\overline{A}\,\overline{C}\,D\,E\,F\,D\,A$	A1
	length $802 + 180 = 982$m	m1 A1✓ (3)
		[15]

3)

A	B	n	C	D	E
1.618	-0.618	1	1.618	-0.618	1
		2	2.618	0.382	1
		3	4.236	-0.236	2
		4	6.854	0.146	3
		5	11.089	-0.090	5

Output : 1, 1, 2, 3, 5

M1 A1 A1 (3)
M1 A1✓ (1)
A1✓
A1
A1 (5)
A1✓ (1)
9

4) a) (i) A cut is a division of the vertices of a flow network into 2 sets, one containing the source(s) and the other containing the sink(s).

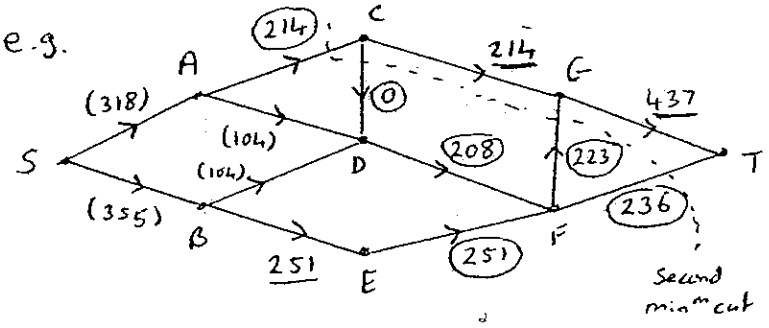
(ii) A cut whose capacity is least

B1
B1 (2)

(b) $C_1 = 1038$, $C_2 = 673$

B1, B2, 0 (3)

(c) e.g.



O = saturated
— = compulsory

M1 A1 A1 (3)

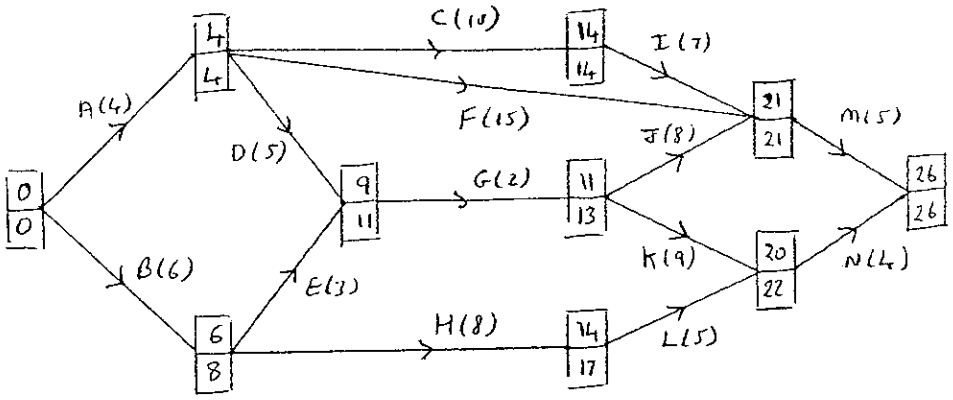
(d) AC, CD, GF, FT

B1 (1)

(e) DE would not allow any further flow into EF
DG would cross both minimum cuts - D can take extra flow, GT can accept it. Flow increases by 86 to 759 (accept either number)

B2, 1, 0 (2)
11

5 (a)



M1 A1

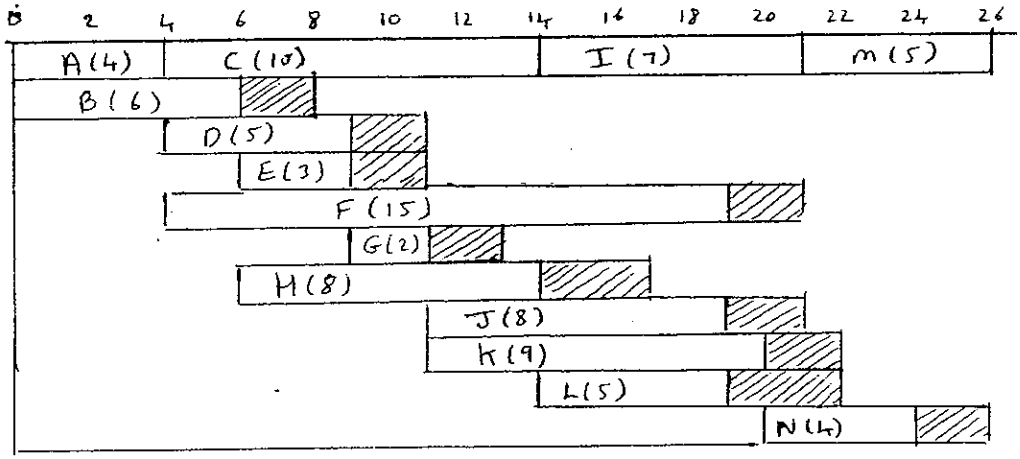
M1 A1

(4)

(b) A C I M length 26

B1 B1√ (2)

(c)



M1

A3, 2√, 1√, 0

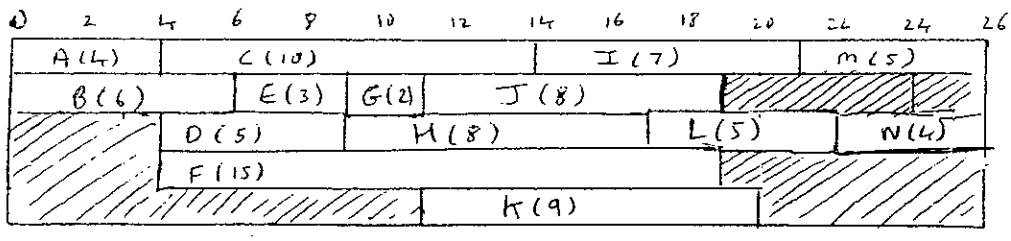
(4)

(d) 5 workers needed e.g. ref to 13-14 when C, F, H, J and K must be taking place
e.g. ref to 18-19 when I F J K L must be taking place

B2, 1, 0

(2)

(e) E.g.



M1

A2, 1, 0

(3)

A < C, F, G B < E, H D, E > G G < J, K I, F, J > M K, L > N H → L

15

6. a) Maximise, $(P=)\ 15x + 15y$ — B1, B1

Subject to $3x + 10y \leq 3000$

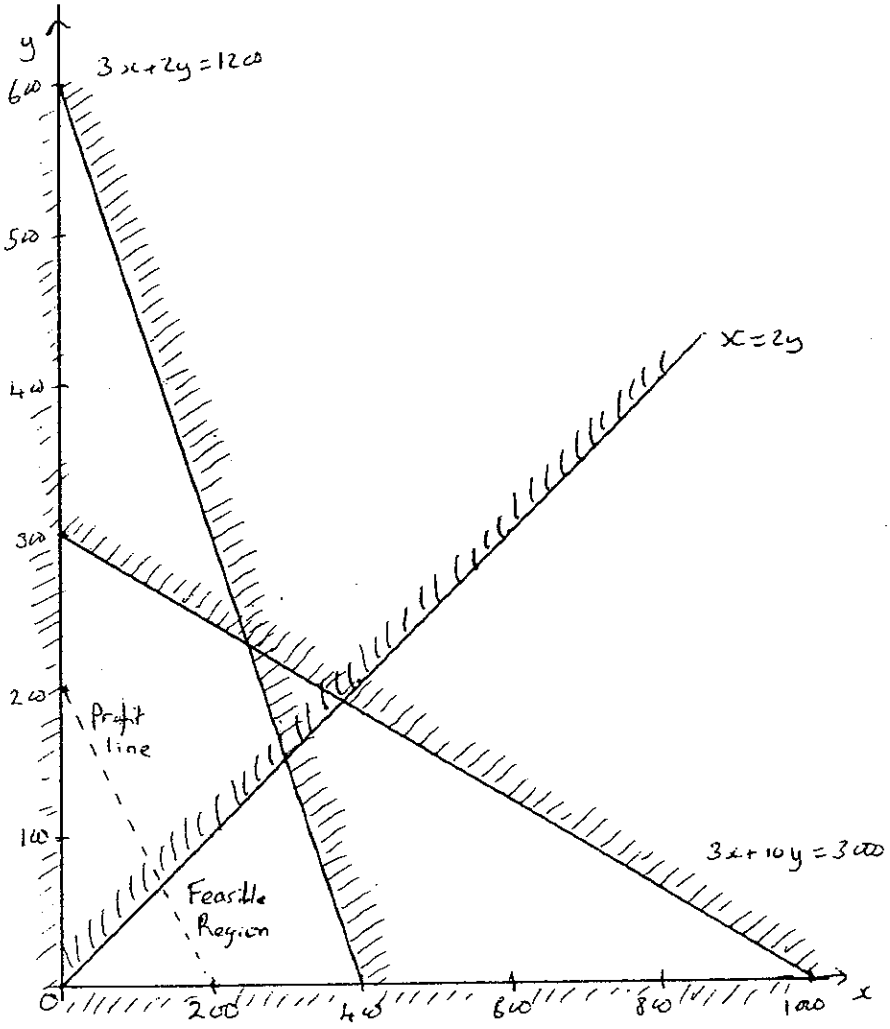
$3x + 2y \leq 1200$ — B3, 2, 1, 0

$x \geqslant 2y$

$x, y \geqslant 0$

(5)

(b)



B6, 5, 4, 3, 2, 1, 0

(6)

(c) Profit line or vertex testing, (300, 150), profit = £67.50 — M1 A1√ A1√ (3)

(d) Production of sticked should be increased since this would move the intersection point further from the origin. — B2, 1√, 0 (2)

(e) e.g.. The constraint lines would be for outside the feasible region - so they would not effect it. — B2, 1, 0 (2)

18